

By Charles Piddock

What do you get when you combine pie pans, radio waves, and hot dogs? For most of us, you get maybe a quick lunch while listening to the radio. But for John Kanzius, 64, the combination paved the way for what could be a cure for cancer.

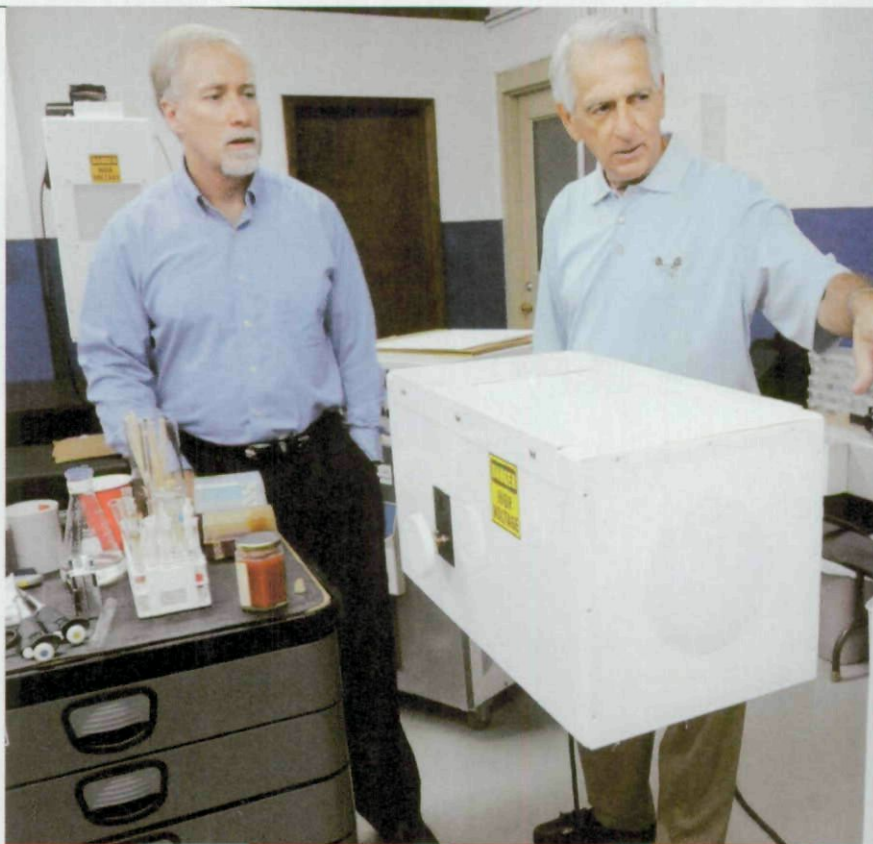
In 2002, Kanzius, a retired radio and TV executive, learned that he had a rare and incurable form of *leukemia*. Leukemia is a cancer of the bone marrow and blood. He immediately began *chemotherapy*, a series of treatments with powerful chemicals that slows the progress of the disease. The treatments had many nasty side effects, including nausea and sleeplessness. During one sleepless night, he hit upon a new idea: fighting cancer with high-intensity radio waves.

Kanzius is not a scientist. He doesn't even have a college degree. But he knows his radio waves. Since childhood, he has been a whiz at radio and television technology.

That night, Kanzius got out of bed, went into the kitchen, and opened some cupboards. Pulling out a bunch of pie pans, he proceeded to cut them up, figuring that they would make good reflectors to focus radio waves. The clanging pans woke up his wife, Marianne. "She thought I had gone completely crazy," Kanzius told *Current Science*. "She felt sorry for me."

After explaining what he had in mind, Kanzius spent the next weeks collecting copper wires, boxes, antennas, and more pie tins to build a machine that generated and focused radio waves. He used a hot dog injected with metal particles as a target for the waves.

"I found that the point where I injected the metal would get hot and the rest of the hot dog would remain cold," he says. "I graduated from hot dogs to steak and liver,



DEEP

A leukemia patient invents a

with the same result." Kanzius reasoned that injecting a cancer tumor with metal particles and then subjecting it to concentrated radio waves would heat the cancer cells and destroy them without harming any of the body's healthy cells.

NANO NANO

Seven years later, Kanzius's invention has created a stir in the world

of cancer research. Two advanced versions of his radio-wave machine are now being tested, one at the University of Pittsburgh and the other at the University of Texas M. D. Anderson Cancer Center. Kanzius had undergone treatment at the Anderson facility under the care of surgeon Steven Curley.

The two versions of Kanzius's machine combine focused radio

White blood cells (leukocytes):

They protect the body against infection. Many types of leukocytes exist, including lymphocytes, granulocytes, and monocytes.

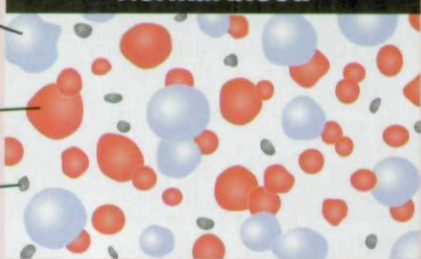
Red blood cells (erythrocytes):

They carry oxygen to the body. More than 99 percent of the cells in blood are red cells.

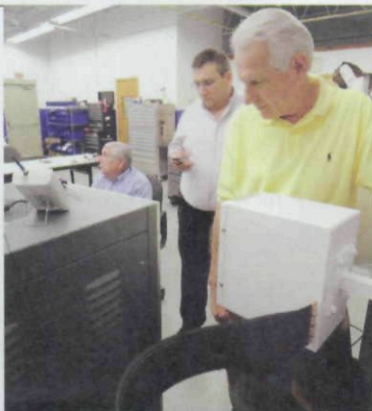
Platelets (thrombocytes):

They are cell fragments that help blood coagulate (clot).

Normal blood



Inventor John Kanzius (right) discusses the workings of his tumor-killing machine with surgeon Steven Curley.



The treatment requires no surgery and produces no side effects.

ON TARGET

Kanzius's idea still needs work. The gold particles have to be engineered so that they attach themselves to cancer cells after the cancer has *metastasized*. Metastasized cancer cells are those that have spread through the bloodstream to other parts of the body.

The researchers are now trying to make "targeting molecules," says Kanzius. Such molecules would hone in on special proteins that exist only on cancer cells and attach themselves to those cells. Cancer patients would be injected with solutions in which the targeting molecules are linked to gold particles. "These would rush to the cancer cells wherever they are in the body," says Kanzius. "You then bombard them with radio waves, clearing out the cancer."

Curley is involved in the research along with David Geller, a professor of surgery at the University of Pittsburgh. They believe that the Kanzius machine, combined with nanodevices, has resulted in a major breakthrough. "This technology may allow us to treat just about any kind of cancer you can imagine," Curley told CBS's *60 Minutes*.

"I've got to tell you, in 20 years of research, this is the most exciting thing that I've encountered."

Even if everything goes well in the current research, it will be at least four more years before human trials can start using the Kanzius machine. By then, it may be too late to help Kanzius, who is still battling leukemia and receiving chemotherapy. Still, it wasn't his own cancer that motivated him most strongly to develop the machine. It was looking into the hollow eyes of sick children at the Anderson center.

"I may have gotten a death sentence at age 58 or 59," he says, "but those children never had a chance. Maybe what I've done will help." **CS**

HEAT

potential cure for the disease.

waves with *nanotechnology*.

Nanotechnology is the engineering of materials at the atomic level.

Nanodevices are only a few *nanometers* in size—the width of an average molecule. One nanometer equals one-billionth of a meter.

Using nano-size gold particles, the researchers have been able to attach the particles to cancer cells in mice and rabbits. The particles

are so small that 100,000 of them could fit on the tip of a hair.

"Comparing one gold nanoparticle to an average cancer cell," says Kanzius, "is like comparing the size of a dime to a pro football stadium." Small, but effective. When energized with concentrated radio waves, the gold particles heat up and kill the animal's cancer cells with little or no damage to nearby healthy cells.

Clockwise from top left: Rob Engelhardt (2); AP Images; Graphic: AFP/Newscom

Leukemia (diseased blood)



Lower counts of: red blood cells, normal white blood cells

Higher counts of: abnormal white blood cells, *blasts* (immature, nonfunctional cells)

Symptoms: fatigue, weight loss, repeated infections, hemorrhages

Treatment: chemotherapy, blood transfusions, antibiotics

Survival: The five-year survival rate in the United States is 38 percent.

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